

WHAT IS CLAIMED IS:

1 1. A laser multiplexing apparatus comprising a
2 compound lens comprising at least two focusing
3 elements arranged to focus at least two respective
4 laser beams to a focal point on a common workpiece.

1 2. An element as defined in Claim 1, in which the
2 compound lens comprises an array of lenses.

1 3. A laser including an element as defined in Claim
2 1.

1 4. A method of multiplexing laser beams comprising
2 temporally interleaving at least two pulsed laser
3 beams such that said beams are multiplexed independent
4 of their state of polarization.

1 5. A method as defined in Claim 4, in which at least
2 two laser beams are spatially separated and in which a
3 variable deviation element focuses the laser beams
4 onto a common target area on a workpiece.

1 6. A method as defined in Claim 4, in which the
2 variable deviation element is moveable so as to focus
3 the temporally interleaved beams onto the common
4 target area on a workpiece.

1 7. A method of multiplexing laser beams comprising
2 the steps, in any order, of:
3 spatially multiplexing laser pulses onto a common
4 workpiece; and

5 temporally interleaving at least some of the
6 spatially multiplexed pulses.

1 8. A method as defined in Claim 7, further
2 comprising temporally overlapping at least some of the
3 pulses.

1 9. A laser multiplexing apparatus comprising:
2 at least two pulsed laser sources for generating
3 pulsed laser beams; and
4 a temporal multiplexing element arranged to
5 temporally interleave at least two pulsed laser beams.

1 10. An apparatus as defined in Claim 9, in which the
2 temporal multiplexing element comprises a variable
3 deviation element.

1 11. An apparatus as defined in Claim 10, in which the
2 variable deviation element comprises a moveable
3 reflector or wedge.

1 12. An apparatus as defined in Claim 10, in which the
2 variable deviation element comprises a moveable
3 refractor.

1 13. An apparatus as defined in Claim 10, in which the
2 variable deviation element comprises a moveable
3 diffractive element.

1 14. An apparatus as defined in Claim 10, in which the
2 variable deviation element has a number of reflective

3 surfaces being an integer number of the number of
4 laser sources being multiplexed.

1 15. An apparatus as defined in Claim 9, further
2 comprising a laser multiplexing element as defined in
3 Claim 1.

1 16. A high power laser produced plasma generation
2 apparatus comprising:

3 a laser as defined in Claim 1; and
4 an apparatus as defined in Claim 9.

1 17. A laser plasma production apparatus comprising:

2 a laser as defined in Claim 1; and
3 a laser apparatus as defined in Claim 9.

1 18. A method of multiplexing laser beams comprising
2 the steps of:

3 directing pulsed laser light from two or more
4 independent lasers onto a movable deviation element;
5 and

6 moving said deviation element at a rate such that
7 deviation of a laser pulse between lead and trailing
8 edges is minimized.

1 19. A laser multiplexing assembly comprising a beam
2 shaping element in which the beam shaping element is
3 arranged to direct a first laser beam along an axis
4 common with a second laser beam axis onto a common
5 focusing element arranged about said common axis.

1 20. An assembly as defined in Claim 19, in which the
2 beam shaping element is arranged to spatially separate
3 the first and second beams.

1 21. An assembly as defined in Claim 19, in which the
2 beam shaping element is formed of a lens.

1 22. An assembly as defined in Claim 21, in which the
2 lens is an axicon lens.

1 23. A method of multiplexing laser beams comprising
2 the steps of directing a first laser beam along an
3 axis common with a second laser beam axis onto a
4 common focusing element arranged about said common
5 axis.

1 24. A laser multiplexing apparatus comprising:
2 a plurality of laser sources each of which
3 generates a laser beam along an axis that is laterally
4 and/or angularly spaced apart from the axes of all
5 other laser beams; and
6 a temporal multiplexing element that is
7 configured and arranged to temporally interleave the
8 laser beams from the plurality of sources such that
9 the plurality of laser beams all propagate close
10 together.

1 25. A laser multiplexing apparatus as defined in
2 Claim 24, wherein the temporal multiplexing element
3 comprises:

4 an array of respective closely spaced, small
5 lenses forming a "fly-eye" arrangement.

1 26. A laser multiplexing apparatus as defined in
2 Claim 24, wherein the temporal multiplexing element
3 comprises:

4 a rotating mirror or prism which introduces a
5 time-varying angular deviation to the laser beams.

1 27. A laser multiplexing apparatus as defined in
2 Claim 24, wherein the temporal multiplexing element
3 comprises:

4 a wedge-shaped prism that is rotated such that an
5 output face of the wedge-shaped prism presents the
6 same angle of incidence to the laser beams in turn as
7 they are sequentially pulsed.

1 28. A laser multiplexing apparatus as defined in
2 Claim 24, wherein the temporal multiplexing element
3 comprises:

4 a plurality of beam shaping elements that have
5 the plurality of laser beams respectively focused
6 thereupon to produce respective coaxial circular
7 output beams; and

8 a common focusing element that produces a
9 substantially collimated annular output beam from the
10 circular annular output beams.